HELMET FACE SHIELD

TECHNICAL FIELD

[0001] The present invention relates generally to shields for protective helmets used for snowmobiling, motorcycle riding and the like. More particularly, the present invention relates to a protective face shield having a removable lens portion.

BACKGROUND OF THE INVENTION

[0002] Protective helmets such as, for example, those used for snowmobiling and motorcycle riding, are well known. They typically include a generally transparent face shield or lens. Two distinct types of helmet face shields are typically employed. Shields having a single pane lens are generally used in warmer environmental conditions. Face shields having a dual lens construction comprising an inner lens and an outer lens, are most often used in colder and more humid conditions. In cold weather, single pane lenses tend to fog up, consequently impairing the rider's vision. However, single pane lenses generally provide better visual properties in comparison with double pane lenses, the thinner single lens causing less optical distortion. Nonetheless, double pane lenses are almost universally used in colder climatic conditions, in order to help keep the face shield substantially free of condensation.

[0003] Many kinds of face shields employ additional techniques to further attempt to prevent fogging. These include lenses having an electrical heating system, wherein an inner lens surface is coated with an electrically conductive film and two electrodes, on opposite edges of the lens, permit an electrical current to flow across the

film covering the lens, thereby inhibiting condensation build up thereon. Other anti-condensation methods are also well known, such as those providing directed ventilation along an inner surface of the lens or employing a hydrophilic anti-condensation layer, in the form of a sheet, film or other covering, that is fitted within an outer lens. These additional anti-condensation devices are typically used in combination with a double-paned lens.

[0004] Most face shields having such a double pane construction comprise two lenses that are contained within a separately constructed perimeter frame, which provides support for the double-paned lens and permits pivotable attachment thereof to the helmet. Double pane lens assemblies are significantly thicker than single paned lenses, and their attachment to some helmets which are not specifically designed to accommodate them can accordingly be difficult without the rather bulky perimeter frame. These face shield perimeter frames can significantly add to the manufacturing cost of the face shield assembly, unduly add bulk and weight to the helmet, and contribute to aerodynamic inefficiencies and increased wind noise.

[0005] Most known face shields that do not comprise perimeter frames, and have double pane lenses or have a hydrophilic layer superimposed on a single lens, do not permit removal of one of the lens panes or the anti-condensation layer. However, it has been known to provide such a frame-free face shield for a protective helmet having a detachably engaged inner lens. US Patent 5,765,235 issued June 16, 1998 to Derek Leslie Arnold, for example, discloses an anti-condensation visor comprising an outer visor for attachment to a helmet and an inner visor, made of hydrophilic material, detachably fitted against the inside

wall of the outer visor and held there against by at least one mechanical retaining element. The inner visor must rest against the inside wall of the outer visor in such a way that no space is left between them. US Patent 4,584,721 issued April 29, 1986 to Tamenobu Yamamoto, discloses a helmet face shield having an electric heating device for preventing fogging. The device comprises a removable inner lens piece attached behind the outer helmet lens. The inner lens piece is generally engaged to the outer lens by a mechanical engagement element such as a snap fastener.

SUMMARY OF THE INVENTION

[0006] It is an object of the present invention to provide an improved face shield for a protective helmet.

[0007] It is another object of the present invention to provide a face shield having a frameless main lens capable of receiving a second lens portion that can be sealed to the main lens with an air gap therebetween to create a double pane lens.

[0008] The present invention permits an inner lens to be engaged to an outer lens such that it is offset therefrom but sealed thereto. The present invention further permits the single pane lens to be converted into a double pane lens having improved anti-condensation properties provided by an air gap trapped between the inner and outer lenses of the sealed double pane lens.

[0009] Therefore, in accordance with the present invention, there is provided a face shield for headgear comprising: a generally transparent main lens adapted for engagement to the headgear; the main lens comprising curved inner and

outer main lens surfaces and having a central recessed portion, the recessed portion having a recessed curved inner lens surface and a recessed curved outer lens surface, the recessed inner lens surface and the recessed outer lens surface being respectively offset from the curved inner and outer main lens surfaces; and the recessed portion being adapted to receive a secondary lens therein such that a sealed air gap is formed between the secondary lens and the main lens, thereby forming a sealed double pane lens having anti-condensation properties.

[0010] There is also provided, in accordance with the present invention, a face shield for headgear comprising: a generally transparent main lens adapted for engagement to the headgear; the main lens comprising curved inner and outer main lens surfaces and having a central recessed portion, the recessed portion having a recessed curved inner lens surface and a recessed curved outer lens surface, the recessed inner lens surface and the recessed outer lens surface being respectively offset from the curved inner and outer main lens surfaces; and a secondary lens, selectively engageable within the recessed portion of the main lens such that a sealed air gap is formed between the secondary lens and the main lens, thereby selectively forming a sealed double pane lens having anti-condensation properties.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] Further features and advantages of the present invention will become apparent from the following detailed description, taken in combination with the appended drawings, in which:

[0012] Fig. 1 is a perspective view of a face shield according to the present invention engaged to a protective helmet;

[0013] Fig. 2 is an exploded perspective view of the helmet face shield of Fig. 1, showing a main lens and a secondary lens;

[0014] Fig. 3 is a front elevation view of the helmet face shield of Fig. 1;

[0015] Fig. 4 is a horizontal cross-sectional view taken along line 4-4 of Fig. 3; and

[0016] Fig. 5 is a perspective view of an alternate embodiment of the secondary lens for engagement with the main lens of Fig. 2.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0017] Referring to Fig. 1, the face shield 10 is adapted to be engaged to, and used with, headgear such as a protective helmet 13 as conventionally used for motorcycle riding, snowmobiling, flying and the like. The face shield 10 is also adapted for use with other protective headgear comprising a transparent face shield, such as paintball masks for example. The face shield 10 comprises primarily a generally transparent main lens 12, thereby providing a single pane lens that does not require a perimeter frame for support or engagement to the protective helmet 13. The main lens 12 is preferably a moulded plastic one-piece element, having a thickness of approximately 2 mm (about 0.07874 inches). The main lens 12 is preferably injection moulded, however other manufacturing techniques could also be used, such as drape or vacuum moulding for example. One skilled in the art will also appreciate that the main lens

12 can have a non-uniform thickness throughout. Particularly, as is known in the art, the lens can be formed such that it is thickest at a center point thereof and becomes gradually thinner towards each edge of the lens. This causes the least distortion of light passing through the lens, enabling the single paned main lens 12 to provide substantially distortion free optical characteristics. The main lens 12 is preferably formed having a curvature about a substantially vertical axis that substantially corresponds to that of the protective helmet 13 to which it is to be engaged, however it generally comprises a substantially semi-circular shape. The main lens 12 can also be outwardly convex throughout the semi-circular length thereof, having a second curvature about a substantially horizontal axis, creating a complex lens curvature. The curved main lens 12 comprises a curved inner main lens surface 14 and a curved outer main lens surface 16.

[0018] The main lens 12 comprises a central recessed portion 18, having a recessed curved inner surface 20 and a recessed curved outer surface 22, the recessed portion 18 being preferably outwardly offset from the main lens 12. The recessed portion 18 preferably comprises most of the main lens 12, such that the recessed portion 18 substantially covers the entire visual field of the user. The offset edges 24 of the recessed portion 18 are therefore located just at the edge or just outside the viewing field of the user looking through the face shield 10 when it is disposed in a normal operating position on the protective helmet 13. The size and shape of the recessed portion 18 preferably corresponds to a forward opening 15 in the protective helmet 13, such that the

offset edges 24 of the recessed portion 18 are near the perimeter of the opening 15 in the helmet 13.

[0019] As seen in Fig.1, helmet engaging members 28 are fixed to the main lens 12 at remote mounting ends 16 thereof. The helmet engaging members 28 are fixed to the remote ends 26 of the main lens 12, and are preferably pivotally engageable to the sides of the protective helmet 13, such that the entire face shield 10 can be pivoted to open or close the opening 15 in the helmet 13. The main lens 12 can thus be used alone as a single pane helmet visor when required. This may be most desirable in warm environmental operating conditions, and for particular applications, such as for motorcycle riding for example.

[0020] However, in colder conditions and applications, such as for snowmobiling for example, a single pane helmet lens tends to fog up. As such, the main lens 12 of the face shield 10 can be modified to provide a double pane lens 19, as seen in Figs. 3 and 4, if desired. A generally transparent secondary lens 30, best seen in Fig. 2, is receivable into the recessed portion 18 of the main lens 12, such that a sealed double pane helmet lens 19 is formed. The secondary lens 30 comprises an inner curved lens surface 32 and an outer curved lens surface 34. The secondary lens 30 is generally formed with a radius of curvature somewhat similar to that of the main lens 12, however the secondary lens 30 is preferably provided with a radius of curvature that is slightly larger than that of the main lens 12. This requires a slight deflection of the secondary lens 30 for it to fit within the recessed portion 18, providing a slight pre-tension in the secondary lens 30, and thereby helping it to remain engaged within the recessed portion 18. The secondary lens 30 is positioned

within the recessed portion 18 such that an air gap 40 remains between the outer curved lens surface 34 of the secondary lens 30 and the curved inner main lens surface 14 of the main lens 12. The secondary lens 30 preferably has a lens thickness that is less than the offset distance of the recessed portion 18 from the curved lens surfaces 14,16 of the main lens 12. The common distance that the recessed curved inner lens surface 20 and the recessed curved outer lens surface 22 are respectively offset from the inner main lens surface 14 and outer main lens surface 16 is preferably approximately 3 mm (about 0.11811 inch). If a secondary lens 30 having a 2 mm (about 0.07874 inch) thickness is used, for example, the air gap 40 will be approximately 1 mm (about 0.03937 inch) wide. It will be understood, however, that other air gap widths and secondary lens thicknesses can be similarly used to achieve the same effect.

[0021] Unlike many double paned lens assemblies of the prior art, the present double pane lens 19 does not require a separately constructed perimeter frame which provides support for the double paned lens assembly, as the secondary lens 30 is retained within the recessed portion 18 of the main lens 12. The elimination of the perimeter frame results in reduced manufacturing, and subsequently retail, costs, a reduction in the overall weight and size of the face shield 10 having the double pane lens 19, and improved aerodynamics. By smoothly integrating the frameless main lens 12 into the helmet 13 such that the outer main lens surface 16 is substantially flush with an outer surface of the helmet 13, reduced aerodynamic drag and noise is provided.

[0022] The secondary lens 30 preferably has a gasket seal 36 disposed around the perimeter thereof. The gasket seal 36 is preferably disposed on one of the outer curved lens surface, and a peripheral edge defined between the inner curved lens surface 32 and the outer curved lens surface 34. When disposed on the outer curved lens surface, the perimeter gasket seal 36 helps to space the secondary lens 30 away from the main lens 12 when positioned within the recessed portion 18, ensuring that a fairly constantly spaced air gap 40 is maintained therebetween. The gasket 36 also seals the air gap 40, ensuring that a sealed double pane lens 19 is maintained. While the gasket seal 36 is preferably disposed on the secondary lens 30 before insertion of the secondary lens 30 into the recessed portion 18 of the main lens 12, it can similarly be inserted independently into the recessed portion 18 before the secondary lens 30 is positioned therein. The gasket seal 36 is preferably made of generally transparent material, such that vision at the offset edges 24 between the secondary lens 30 and the main lens 12 is not obscured. The gasket seal 36 is preferably as transparent as possible, but materials that are merely translucent can also be employed. A generally transparent silicone bead, for example, can be used as the gasket seal 36. Such a silicone bead is preferably sufficiently compressible when the secondary lens 30 is engaged within the recessed portion 18, such that a slight vacuum is created between the secondary lens 30 and the main lens 12, thereby holding the secondary lens 30 in place therein. The slightly larger radius of curvature of the secondary lens 30 relative to the main lens 12 further provides frictional retention of the secondary lens 30 within the recessed portion 18 of the main lens 12. Other substantially

permanent retention means, such as adhesives or sealing tape for example, can be used to fix the secondary lens 30 within the recessed portion 18 and to seal the air gap 40 therebetween.

[0023] Alternately, other temporary retention means can be used which permit the user to add and/or remove the secondary lens 30 from the main lens 12 whenever required. This may be desirable, for example, if a protective helmet 13 having the face shield 10 is to be used both for motorcycle riding in warm weather and snowmobile riding in cold weather. In such a case, the main lens 12 is preferably used by itself in the warmer conditions to provide improved visibility. The secondary lens 30 may be subsequently inserted within the recessed portion 18 of the main lens 12 to form the double pane lens assembly 19 in colder conditions, to provide improved anti-condensation properties. In such a case, the secondary lens 30 is therefore engaged within the recessed portion 18, using removably fastenable members such as temporary adhesives, removable two-sided tape, or hook and loop fasteners for example. With such temporary fastening means, the secondary lens 30 nonetheless preferably forms a seal with the main lens 12 such that the sealed air gap 40 is provided therebetween in the recessed portion 18. The temporary fastening means may provide the sealing themselves, or an additional seal may be provided in addition to the temporary fastening means.

[0024] The addition of the secondary lens 30 to the main lens 12 can be done either by the user as an after-market upgrade, or by the manufacturer, permitting a more cost effective way of producing different face shields for various applications. Particularly, rather than producing

two distinct product lines, a common main lens 12 can be used alone or in combination with a secondary lens 30 to create a double pane lens 19. For example, the main lenses 12 can be either sold alone as a single pane face shield, or be permanently assembled with the secondary lens 30 in the factory for sale as a sealed double pane lens 19 particularly adapted for cold climatic applications. The secondary lenses 30 could also be sold independently, for selected assembly by the user for converting a single pane lens into a cold weather, sealed double pane lens 19. The secondary lens 30 can either be as transparent as the main lens 12, or can comprise a tint, such that a shaded double pane lens 19 is created.

[0025] The seal formed between the secondary lens 30 and the main lens 12, ensuring the sealed air gap 40 therebetween, maintains thermal properties of the double pane lens 19 formed by the assembly of the main lens 12 and the secondary lens 30. Such a sealed, dual plane lens 19 is much more effective at preventing condensation at low temperatures than single paned lenses or double lenses that do not form a sealed air gap therebetween.

[0026] A secondary lens 50 of an alternate embodiment, shown in Fig. 5, is alternately used in place of the secondary lens 30 for engagement with the main lens 12 to form the sealed dual plane lens 19. The alternate secondary lens 50 is similarly shaped to the secondary lens 30, and is equivalently receivable into the recessed portion 18 of the main lens 12. The secondary lens 50 is generally transparent, although can comprise a tint if desired, and comprises a curved inner lens surface 52 and a curved outer lens surface 54. The secondary lens 50 preferably includes a perimeter seal 56 thereon, disposed either about a

perimeter of the curved outer lens surface 54 or on the perimeter edge between the inner curved lens surface 52 and the curved outer lens surface 54. The secondary lens 50 differs from the secondary lens 30 in that it comprises an electrical heating system 60 which provides additional anti-fogging capabilities. The electrical heating system 60 generally includes at least two elongated electrodes, normally an upper electrode 62 extending along an upper margin of the secondary lens 50 and a lower electrode 64 extending along a lower margin of the secondary lens 50. While the upper and lower electrodes 62,64 are preferably located on the outer lens surface 54, they can be alternately disposed on the inner lens surface 52 without significantly altering their anti-condensation effect. Between the upper and lower electrodes 62,64 is provided a transparent electro-conductive film 68 substantially covering the entire outer lens surface 54. The transparent electro-conductive film 68 is preferably a thin layer of indium tin oxide (ITO), applied by sputter coating on the outer curved lens surface 54. Such an ITO coating provides high visible light transmission, low reflectivity and substantially uniform electrical conductivity. Insulated electrode contacts 66 are in electrical contact with the upper and lower electrodes 62,64 and extend through the secondary lens 50 to the inner lens surface 52. Conductors (not shown) linked to a power supply can then be engaged to the electrode contacts 66, such that power is supplied across the upper and lower electrodes 62,64, resulting in an electrical flow across the electro-conductive film 68. The conductors can comprise wires or another electro-conductive film, such as an electrically conductive silk screen ink, for example, formed on the inner lens surface 52. Another transparent electro-conductive film on the

inner lens surface 52 may be used as the conductor linking the power supply to the electrode contacts 66. This eliminates any possible vision impeding elements being located on the lens surfaces. Such a strip of transparent ITO film extends along the inner main lens surface 14 of the main lens 12 and inner lens surface 52 of the secondary lens 50, linking a connection to the power supply within the helmet attachment members 28 to the electrode contacts 66 on the secondary lens 50. Resistance to the flow of electricity across the electro-conductive film 68, between the upper and lower electrodes 62,64 on the outer lens surface 54, causes heat. This heating of the secondary lens 50 thereby further helps to prevent or reduce the formation of fog, frost and ice on the sealed double pane lens assembly 19, comprising the main lens 12 and the secondary lens 50. Much as the secondary lens 30, the alternate secondary lens 50 having the electrical heating system 60 can be either permanently fixed within the recessed portion 18 of the main lens 12, or can be selectively removable therefrom as described above. Although the electrical heating system 60 is described herein as being preferably engaged on the secondary lens 50, it is to be understood that it can also be disposed on the main lens 12, and particularly on the recessed curved inner surface 20.

[0027] The frame-less face shield 10 according to the present invention has great versatility. The main lens 12 can be used alone as a single pane, warm weather shield. When required, this can be converted into a cold weather, sealed double pane lens 19 with the addition of one of the secondary lenses 30 or 50 into the central recessed portion 18 of the main lens 12, providing a sealed air gap 40 therebetween. This provides a face shield having a thermal

barrier, the double pane lens 19 providing improved anti-condensation properties at low temperatures. The best anti-condensation abilities of the face shield 10 are provided when using the alternate secondary lens 50 having the electrical heating system 60 therein, which may be suited for very cold environmental conditions. The face shield 10 can therefore be selectively adapted for different uses and different environmental conditions as required, whether before consumer sale or after-market.

[0028] It is understood that numerous modifications to the face shield according to the present invention will be evident to those skilled in the art. Accordingly, the above description and accompanying drawings should be taken as illustrative of the preferred embodiments of the invention and not in a limiting sense. It will be further understood that the present invention is intended to cover any variation, use or adaptation of the invention following, in general, the principles of the invention and including such departures from the present disclosure as come within known or customary practice within the art to which the invention pertains, and as may be applied to the essential features herein set forth and as follow in the scope of the appended claims.